plowed in order to supplement grass sod or other non-legume residues, such as straw or cornstalks; thus, "capturing" extra-high-protein humus. They may be applied as a sidedressing or in some cases sprayed directly onto plants with low-pressure sprayers.

Three solutions that are being used by farmers or being tested by experiment stations are: Solution - 2A, Anhydrous Ammonia, and Solution - 32.

Solution - 2A was most widely used in 1953. It has 40.6 percent nitrogen, which amounts to about 3½ pounds of nitrogen per gallon. Some of it was plowed down, but the largest percentage was used to sidedress corn and vegetable crops. It is one of the most economical sources of nitrogen. In 1953 farmers obtained it at fertilizer plants in their own barrels. The nitrogen in this solution costs about one-half as much per pound as the nitrogen in solid forms.

The equipment required to apply Solution 2-A is a simple, inexpensive gravity type.

Anhydrous Ammonia, which is 82 percent nitrogen, is contained under 211 pounds of pressure per square inch; thus, it must be handled in pressure tanks, hoses, valves. tion is expensive, but the cost of nitrogen from this source is low. If it becomes widely used, it will no doubt be handled mainly by custom operators.

Solution-32 is made up of about ½ urea nitrogen, ¼ ammonia nitrogen, and ¼ nitrate nitrogen. It is 32 percent total nitrogen. It has the advantage that it can be sprayed directly on young plants at reasonable rates without burning or injuring them. Weed-spray equipment can be adapted to handle this material.

SUPERPHOSPHATED MANURE

The use of superphosphate in the stable:

- Balances the nutrients by increasing the phosphorus content.
- Absorbs and holds nitrogen that otherwise might be lost.
- Absorbs moisture and reduces slipperiness in the runways.

Manure is notably low in phosphorus, and the addition of superphosphate makes it a better balanced fertilizer.

Superphosphate applied with the manure is held in more available form than if applied directly to the soil.

If applied to soils that are very low in phosphorus, 2 pounds per cow per day would supply an adequate reserve of this element in a readily available form. On the other hand, where the phosphorus level of the soil has been maintained by moderate fertilization, 1 pound of superphosphate per cow per day is enough.

rather than replace hill or row application. It is a safe method of increasing the rate of use of fertilizer on corn. On old bluegrass sod, 100-bushel yields have been made by plowing down from 400 to 500 pounds of 10-10-10 grade fertilizer and applying from 300 to 400 pounds of the same fertilizer at planting time.

Small Grains

Fertilizer and seed should be drilled simultaneously with the grain drill which places the fertilizer close to and in partial contact with the seed. No injury has resulted when from 60 to 900 pounds per acre of standard grade mixed fertilizers have been applied directly with the seed.

Legumes and Grasses

The preferred method is to drill the fertilizer from 1 to 3 inches deep either with or without a companion crop. Drilling the fertilizer with the small grain when the seeding is made is satisfactory. Small-seeded legumes and grasses (except brome and orchard) can be broadcast or hand-seeded behind the drill.

To convert a drill to band-seed, the tube from the seed box must be extended with garden hose, electrical conduit, or some other type of extension to the rear of the drill. The extension tube should be firmly mounted with steel-pipe-hanger straps so that the discharge end runs about 1½ inches above the soil and 9 inches or more behind the disc or hoe. Band seeding is especially useful on low-fertility soils. If care is not exercised in dropping the seed directly above the fertilizer band, more would be lost than gained by this method.

TOP-DRESSING MEADOWS AND PASTURES

Legumes

Where there is a high percentage of legumes (20 percent or more) a soil test would be useful to help determine the kind of fertilizer to apply. If the soil tests high in potassium, only superphosphate would be needed since the legume makes its own nitrogen. If the soil is deficient in both phosphorus and potassium, a 0-1-1 ratio fertilizer, such as 0-20-20, should be applied. If the soil is fairly adequately supplied with phosphorus but potassium is deficient, a 0-1-2 ratio fertilizer, such as 0-15-30, would give the most economical results.

Where potassium is needed, it is best to apply the fertilizer annually immediately after the first cutting.

Mostly Grass Meadows

Nitrogen is the element that makes grass grow the most rapidly. Either manure or straight nitrogen fertilizer does

3. OATS *or* **BARLEY not seeded**		1–1–1	30–30–30	300 lbs. 10–10–10	Mohawk, Clinton, Craig oats or Moore barley	Omit fertilizer if grain is likely to lodge.
			20–20–20	200 lbs. 10–10–10	Weak-strawed varieties	
4. WHEAT *or* **WINTER BARLEY**		1–2–1 and 1–0–0	20–40–20 plus 33– 0– 0	250 lbs. 8–16–8 and 100 lbs. am. nitrate or equivalent (and 6 tons manure)	At planting time Top-dress in early spring. Omit if wheat is likely to lodge or stand is too thin. (For wheat to be seeded to a forage crop)	Fertilize forage seeding as in following years outlined under Crop 9 if seeded.
5. RYE		1–2–1	20–40–20	250 lbs. 8–16–8	If seeded, fertilize forage crop later as outlined in Crop 9.	
6. ALFALFA— (summer seeded) No companion crop	High potash soils*	0–1–0	0–80– 0	400 lbs. 20% or 175 lbs. 45% superphosphate	Apply at planting time.	
	Extra potash needed*	0–1–1	0–60–60	300 lbs. 0–20–20	Top-dress seeding later. See Crop 9.	
	Generally low fertility	1–2–2	30–60–60	375 lbs. 8–16–16	Band-seeding may have particular application here to improve establishment.	
7. BIRDSFOOT TREFOIL seeded without a companion crop	Soils low in nitrogen (old grass sods)	1–2–1	30–60–30	375 lbs. 8–16–8	Band seeding may have special advantage here because of the low fertility.	
	Soils with medium to high nitrogen	0–1–1	0–60–60	300 lbs. 0–20–20	For soils low in potash not receiving manure.	
		0–1–0	0–80– 0	400 lbs. 20% or 175 lbs. 45% superphosphate	For soils medium to high in potash.	
8. SUDAN GRASS Seeded	Manured	1–1–1	20–20–20	8 T. phosphated manure plus 200 lbs. 10–10–10	Top-dress seeding later. See Crop 9.	
	Not manured	1–2–1	30–60–30	375 lbs. 8–16–8	Use 1–2–2 ratio where extra potash is needed. Top-dress seeding later. See Crop 9.	
		1–2–2	30–60–60	375 lbs. 8–16–16		
Not seeded		1–1–1	40–40–40	400 lbs. 10–10–10	Where not used as companion crop for forage seeding.	
9. ALFALFA *or* **LADINO CLOVER (top-dress)**	Not manured: High potash need* (for high production on gravels, sands, and some silt loams)	0–1–2	0–30–60	200 lbs. 0–15–30	Best on very low potash soils where soil phosphorus is medium to high.	For best efficiency, apply after first cutting of hay, or after flush of spring grazing.
		0–1–1	0–60–60	300 lbs. 0–20–20	For soils low in both phosphorus and potash or where very large yields are removed. May be alternated with manure or 0–1–2.	
	Moderate potash need*	0–1–1	0–30–30	150 lbs. 0–20–20	Where some potash is needed on loams and slightly heavier soils.	
	Low potash need*	0–1–0	0–120– 0	600 lbs. 20% or 265 lbs. 45% superphosphate	For soils that have a high potash supplying power (clays, heavy loams) or where unphosphated manure is used. Repeat after 4 years.	
10. GRASS MEADOW (topdress)	Manured			6 T. manure	Apply manure or 10–10–10 every other year *and* straight nitrogen fertilizer in the year between. On heavy soils, nitrogen alone may be applied each spring for 2 or 3 years before a complete fertilizer is needed.	
	Not manured	1–1–1 or 1–0–0	50–50–50 or 50– 0– 0	500 lbs. 10–10–10 or 150 lbs. am. nitrate or equivalent		
11. UNIMPROVED PASTURE	For quick initial results	1–2–1	40–80–40	500 lbs. 8–16–8	Apply to no more than ½ acre per cow to be grazed. Quick results depend upon a fair stand of desirable grasses.	
12. NATIVE PASTURE to maintain white clover	Manured			6 T. phosphated manure	Spread evenly at least 2 months before spring grazing.	
	Not manured	0–1–1	0–40–40	200 lbs. 0–20–20	Apply after flush of spring growth on light textured soils.	
		0–1–0	0–120– 0	600 lbs. 20%, or 265 lbs. 45% super	Use where potash is not a problem on heavy loams and clays.	
13. BUCKWHEAT		1–2–1	10–20–10	200 lbs. 8–16–8		
14. SOYBEANS		1–2–2	16–32–32	200 lbs. 8–16–16		

*Three useful guides to the potash status of a field:

1. Sands and gravels are naturally lower in potash than heavier textured loams, silt loams, and clay loams. There are, however, differences in soils of the same surface texture in the rate at which they supply potash.
2. Heavy applications of manure or high potash fertilizers build a temporary potash reserve.
3. A soil test is becoming more valuable as a guide on very low or very high potash soils. Check with your county agricultural agent.

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a good job of increasing acre yields. A 50-pound per acre application of nitrogen should increase the yield of a good timothy sod at least ½ ton. If phosphorus and potassium are also low, alternate use of a 1-1-1 ratio fertilizer or phosphated manure every other year will maintain a high mineral level in the hay or grass.

SOIL TESTING

Complete soil tests for pH, total organic matter, and available phosphorus, potassium, and magnesium are available through local county agricultural agents, who have containers and instructions for taking the samples. The county agent sends the samples to the Soil Testing Laboratory of the Department of Agronomy at Cornell. He also makes recommendations for fertilizer use and soil management after receiving the results of the tests from the laboratory.

FERTILIZERS FOR FIELD CROPS, 1954

Ratio: Refers to the balance or relative amount of nitrogen (**N**) to phosphorus (P_2O_5) to potassium (K_2O) in a mixed fertilizer. A 1–1–1 ratio, has the same relative amounts of these three plant foods, but a 1–2–1 ratio has twice as much phosphorus as either nitrogen or potash.

Analysis or Grade: Refers to the actual guaranteed composition of the fertilizer. A 1–1–1 ratio may therefore be available in several grades, such as 12–12–12, 10–10–10, or 7–7–7. Likewise a 1–2–2 ratio may be purchased as 5–10–10 or 8–16–16.

The high-analysis grades are usually the better buy since savings are made in the transportation and handling of the more concentrated materials. They cost more per ton but less per pound of nutrients.

Amount: Apply fertilizer according to the total recommended amounts of nutrients. Thus 35–70–70 pounds of $N–P_2O_5–K_2O$ can be applied as either 440 pounds of 8–16–16 or 700 pounds of 5–10–10.

Composition of Un-mixed Fertilizer Materials:

Nitrogen		Phosphorus	
Ammonium nitrate	33.5% N	Superphosphate	18–20% P_2O_5
Ammonium sulfate	20.5% N	Triple-Superphosphate	45% P_2O_5
Ammonium Nitrate Limestone (ANL)	20.5% N		
Calcium Cyanamid	21% N		
Sodium Nitrate	16% N		
Urea	40–46% N	**Potash**	
Nitrogen Solution 2-A	40.6% N	Muriate of Potash	60% K_2O
Anhydrous Ammonia	82% N		

The high-analysis grades are listed for each crop in the large table but equivalent amounts of the lower analysis grades of the same ratio can be determined from the small table below.

Consult Your Local Dealer for the "Best Buy" Grade Available.

Ratios $N–P_2O_5–K_2O$	*Grades*		*If alternate is used, multiply amount in table by:*
	First Choice $N–P_2O_5–K_2O$	*Alternate*	
1–1–1	10–10–10 or 12–12–12	7–7–7	1.4
1–2–1	8–16–8 or 10–20–10	6–12–6 or 5–10–5	1.3 1.6
1–2–2	8–16–16 or 10–20–20	5–10–10	1.6
0–1–1	0–20–20	0–14–14	1.4
0–1–2	0–15–30	0–12–24	1.2

Fertilize the Rotation: These fertilizer recommendations are given for each individual crop. The fertility program for a field can best be planned on the basis of the whole rotation, because a large amount of fertilizer applied to one crop influences the kind and amount that is needed for the crops that follow.

Phosphated Manure: Some farmers use 2 pounds of superphosphate on the stable floor per cow each day. Soil tests show that farmers who have followed this practice for many years, together with liberal fertilization at planting time, have accumulated a high phosphorus reserve in some fields. It is more economical for these farmers to shift to 1 pound of superphosphate.

Crop	Situation	Recommended Nutrients: Ratio $N–P_2O_5–K_2O$	Recommended Nutrients: Lbs. per acre $N–P_2O_5–K_2O$	Suggested Analysis and Application: Amount per acre	Special Suggestions	
1. **CORN**	Manure or a good legume sod, plowed down	1–1–1	20–20–20	10 T. phosphated manure plus 200 lbs. 10–10–10	Fertilize in the row at planting time or use 125 pounds of 8–16–16 at planting plus 20 to 30 pounds of nitrogen as a side-dressing.	
	No manure, no legume sod	1–1–1 and 1–0–0	40–40–40 plus 30– 0– 0	400 lbs. 10–10–10 and 100 lbs. am. nitrate or equivalent	Row fertilize at planting time. There may be danger of fertilizer "burn" at this or higher rates if the fertilizer is placed **in contact with** seed. **Top-dress** grass sod before plowing or **side-dress** corn when 12 to 18 inches tall. Side-dressing most needed if heavy rains after planting leach the nitrogen.	
2. **OATS** *or* **BARLEY seeded to a forage mixture**	Not likely to lodge: High potash soils*	1–2–1	35–70–35	440 lbs. 8–16–8	Mohawk, Clinton, Craig oats or Moore barley	Top-dress seedings in following years as outlined under Crop 9.
			20–40–20	250 lbs. 8–16–8	For weak-strawed varieties	
	Medium to low potash soils*	1–2–2	35–70–70	440 lbs. 8–16–16	Mohawk, Clinton, Craig oats or Moore barley	
			20–40–40	250 lbs. 8–16–16	For weak-strawed varieties	
	Where grain may lodge: High potash soils*	0–1–0	0–80– 0	400 lbs. 20% or 175 lbs. 45% superphosphate	While lodging is still a problem on some heavily manured fields (especially valley farms), farmers are generally urged to use nitrogen on the stiff-strawed varieties.	
	Medium to low potash soils*	0–1–1	0–60–60	300 lbs. 0–20–20	Top-dress seedings in later years as outlined under Crop 9.	
3. **OATS** *or* **BARLEY not seeded**		1–1–1	30–30–30	300 lbs. 10–10–10	Mohawk, Clinton, Craig oats or Moore barley	Omit fertilizer if grain is likely to lodge.
			20–20–20	200 lbs. 10–10–10	Weak-strawed varieties	
4. **WHEAT** *or* **WINTER BARLEY**		1–2–1 and 1–0–0	20–40–20 plus 33– 0– 0	250 lbs. 8–16–8 and 100 lbs. am. nitrate or equivalent	At planting time Top-dress in early spring. Omit if wheat is likely to lodge or stand is too thin.	Fertilize forage seeding as in following years outlined under Crop 9 if